UNITED STATES PATENT AND TRADEMARK OFFICE

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10/722,225	11/25/2003	Helmut Barfuss	P03,0443	6704

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EXAMINER
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/722,225	Applicant(s) BARFUSS ET AL.
	Examiner Sean Motsinger	Art Unit 2624

-- *The MAILING DATE of this communication appears on the cover sheet with the correspondence address* --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE <u>3</u> MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on *11/25/2003*.

2a)☒ This action is **FINAL**.   2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-24* is/are pending in the application.

    4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) *5-9 and 17-24* is/are allowed.

6)☒ Claim(s) *1-5 and 10-16* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on <u>25 June 2007</u> is/are: a)☒ accepted or b)☐ objected to by the Examiner.

    Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

    Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

    a)☒ All   b)☐ Some * c)☐ None of:

      1.☒ Certified copies of the priority documents have been received.

      2.☐ Certified copies of the priority documents have been received in Application No. _____.

      3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

    * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1)☒ Notice of References Cited (PTO-892)

2)☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3)☐ Information Disclosure Statement(s) (PTO/SB/08)
    Paper No(s)/Mail Date _____.

4)☐ Interview Summary (PTO-413)
    Paper No(s)/Mail Date. _____.

5)☐ Notice of Informal Patent Application

6)☐ Other: _____.

Response to Applicants Arguments

1.   The amendment to the Claims filed on 6/25/2007 has been entered and made of
record.

2.   Re the objection to the drawings, the added drawings show the steps of claims 1-
9 and therefore they are withdrawn.

3.   Re the objections to claims 5, 15 and 23, these objections have been overcome
in view of the amendments to the claims.

4.   Re the rejections to claims 2-4, 11-16, 22 and 23 under 35 U.S.C. 112 first
paragraph, these rejections have been overcome.

5.   Applicant has argued that the claims 1 and 10 are allowable because the
combination of Wang and Eldeib does not read on the application as claimed in
claim 1. Applicant states in his argument that his invention is to segment out the
surface and perform 2-d search to locate marks on the surface of the object in a 3-D
image. Applicant also admits that Wang discloses locating marks disposed on the
surface of the object in a 3-D image. Applicant argues that the combination of Wang
and Eldeib would be useless because Eldeib provides registration of 2 3-D images
by segmenting out their surfaces and aligning them using points on there surfaces
which are not marks applied top the surface of the object at the time of acquisition.

Applicant states the marks in Wang would not be necessary for use in the Eldeib invention. Examiner rejects these arguments for the following reasons. Applicants argument seems to focus on arguing that modifying Eldeib to use Wang's marks would be useless, however this misses the point because examiner is modifying locating the marks of wang using the method of surface segmentation in Eldieb. Applicant also states that the references are too different to combine, examiner disagrees because while both references have different applications they are at heart ways of locating points in a 3-D image. Eldiebs method could easily be adapted to look for the physical marks in Wang. Therefore in the method of Wang it makes sense to use Eldiebs method of locating points on the surface of a 3-d image for the reasons stated in the prior action (faster runtime). The mere fact that the points as used Eldeib are not physical markers and are located for a different reason does not prohibit using Eldeibs method of locating points in the environment of Wang.

Rejections Under 35 USC 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

6.   Claims 1, 2 10, 11, and 14 are rejected under 35 U.S.C. 103(a) as being

unpatentable over Wang et al US 6,052,477 in view of "Volume Registration by

Surface Point Signature and Mutual Information Maximization with Applications in

Intra-Operative MRI Surgeries," Eldeib et al, Proc. Int. Conf. On Image Processing,

Vol. 1 (2000) 200-203 hereinafter "Eldeib"

7.   Re claim 1 Wang discloses A method for determining coordinates of images of

marks in a volume dataset, said marks being disposed on a surface of a subject and

said volume dataset containing the images of the marks and an image of at least a

part of the subject containing the surface on which the marks are disposed (see

abstract Note Wang discloses a method capable of performing this function),

comprising the steps of: determining coordinates (centroids) of the images of the

marks in the volume dataset (column 2 lines 24-27).

8.   Wang does not disclose segmenting the image of the surface; transforming the

volume dataset so that the segmented image of the surface is transformed into a

plane; generating an image dataset substantially comprising pixels of the image of

the surface after transformation into the plane and pixels of the images of the marks;

determining coordinates of the images of the marks in the image dataset.

9.   Eldeib discloses segmenting the image of the surface (see section 2 paragraph 1

line1 note the surface is being segmented out); transforming the volume dataset so

that the segmented image of the surface is transformed into a plane (see section 2

paragraph 1 lines 8-11); generating an image dataset substantially comprising pixels

of the image of the surface (see section 2 paragraph 1 line1 note the surface is

being segmented out) after transformation into the plane and pixels of the images of

the marks (note the marks of Wang will also be found because the are disposed on

the surface section 2 paragraph 1 line1); determining coordinates of the images of

the marks in the image dataset (section 2 paragraph 5 note Eldeib discloses that this

can be useful for matching operations (ie finding marks) and section 3 paragraph

one volume registration). The advantage of Eldeib is one can "...now use matching

image processing tools in the matching hence reduceing the time taken..." (section 2

paragraph 5). Therefore it would have been obvious to combine Eldeib with Wang to

reach the aforementioned advantage.

10.   Re claim 2 Eldeib further discloses determining the coordinates of the images of

the marks in the image dataset by filtering (template matching section 2 paragraph 5

line 8) said image dataset.

11.   Re claim 10 Wang discloses A medical apparatus comprising: a medical imaging

device (CT or MRI scanner see column 1 lines 33-36) for obtaining a volume dataset

(column 1 line 33) from a subject representing an image of at least a portion of the

subject (patient column1 line 34) containing a surface on which a plurality of marks

are disposed (feiducial markers column 1 line 25), and images of the marks (note

the language following "for" is intended use and the CT scanner need only be

capable of said function); a navigation system (navigation column 1 line 46) for

relating coordinates of the volume dataset (images column 1 line 47) to coordinates

of the subject (patient anatomy column 1 line 47) by a coordinate transformation

(mapping between the coordinates column 1 lines 49-50) during a registration

(column 1 line 48); and determining coordinates of the images of the marks in the

volume dataset.

12.   Wang does not disclose said navigation system segmenting the image of the

surface, transforming the volume dataset so that the segmented image of the

surface is transformed into a plane, generating an image dataset substantially

comprising pixels of the image of the surface after transformation into the plane and

pixels of the images of the marks, determining coordinates of the images of the

marks in the image dataset.

13.   Eldeib discloses segmenting the image of the surface (see section 2 paragraph 1

line1 note the surface is being segmented out); transforming the volume dataset so

that the segmented image of the surface is transformed into a plane (see section 2

paragraph 1 lines 8-11); generating an image dataset substantially comprising pixels

of the image of the surface (see section 2 paragraph 1 line1 note the surface is

being segmented out) after transformation into the plane and pixels of the images of

the marks (note the marks of Wang will also be found because the are disposed on

the surface section 2 paragraph 1 line1); determining coordinates of the images of

the marks in the image dataset (section 2 paragraph 5 note Eldeib discloses that this

can be useful for matching operations (ie finding marks) and section 3 paragraph

one volume registration). The advantage of Eldeib is one can "...now use matching

image processing tools in the matching hence reducing the time taken..." (section 2

paragraph 5). Therefore it would have been obvious to combine Eldeib with Wang to

reach the aforementioned advantage.

14.   Re claim 11 Eldeib further discloses filter for filtering the image dataset to

determine the coordinates of the marks in the image dataset (template matching

section 2 paragraph 5 line 8).

15.   Re claim 14 Wang discloses wherein said navigation system includes a position

sensor (finding the centroids of fiducial markers attached to the head in ... images of

other modalities column 2 25-30) for identifying the marks for the registration.

16.   Claims 15 and 16 are rejected under 35 U.S.C. 103(a) as being unpatentable

over Wang and Eldeib in further view common knowledge in the art

17.   Re claim 15 Wang discloses wherein said marks is are optically detectable marks

(fiducial mark see abstract) and detecting them by "other imageing modalities"

column 2 lines 25-30 Wang does not disclose wherein said position sensor is an

optical detector. However the examiner is taking official notice that optical image is a

notoriously well known image to take (which requires an optical detector.) One of

ordinary skill in the art would know how to substitutes a optical image for "other

imaging modalities" and the result of registering an optical and MR or CT image

would be predictable to one of ordinary skill in the art. Therefore it would be obvious

to combine Wang with common knowledge in the art to reach the aforementioned

advantage.

18.   Re claim 16 wherein said medical imaging device is a first medical imaging

device, and further comprising a second medical imaging device (MRI column 1 line

42) for obtaining an image of the subject. Wang does not disclose a data processing

system that fades an image obtained with said second imaging device into an image

allocated to the volume data set. Examiner is taking official notice that fading one

image into another is a notoriously well process. One of ordinary skill in the art

would know to fade one image into another and the result of fading one image into

another would be easily predictable to one of ordinary skill in the art. Therefore it

would be obvious to combine Wang with common knowledge in the art to reach the

aforementioned advantage.

19.   Claims 3-4 and 12-13 are rejected under 35 U.S.C. 103(a) as being unpatentable

over Wang and Eldeib in further view of "Digital Picture Processing," Rosenfeld et al

(1982), pages 37-49.

20.   Re claim 3 Wang and Eldieb disclose all of the elements of claim 2. Eldeib does

not disclose any suitable method of template matching i.e. does not disclose filtering

said image dataset with a filter matched to said marks. Rosenfeld discloses filtering

(linear matched filtering section 9.4.2 title) said image dataset with a filter matched

to said marks (matched filtering section 9.4.2 paragraph 1 lines 4-6). The motivation

for combining is that "under certain assumptions the best filter to use is f itself (i.e.

matched filter)." Therefore it would be obvious to one of ordinary skill in the art to

combine Rosenfeld with Wang and Eldieb to reach the aforementioned advantage.

21.   Re claim 4, Wang and Eldieb disclose all of the elements of claim 2. Eldeib does

not disclose any suitable method of template matching i.e. does not disclose filtering

said image dataset according to the minimum square error sum. Rosenfeld discloses

filtering said image dataset according to the minimum square error sum (Section

9.4.1 paragraph 1 note the third of these expressions is the minimum square error.)

The motivation for combining is that "if we use $\iint (f-g)^2$ as a measure of mis-match

we can derive an important measure of match" Therefore it would be obvious to one

of ordinary skill in the art to combine Rosenfeld with Wang and Eldieb to reach the

aforementioned advantage.

22.   Re claim 12 Wang and Eldieb disclose all of the elements of claim 2. Eldeib does

not disclose any suitable method of template matching i.e. does not disclose wherein

said filter is matched to said marks. Rosenfeld discloses wherein said filter is

matched to said marks (matched filtering section 9.4.2 paragraph 1 lines 4-6). The

motivation for combining is that "under certain assumptions the best filter to use is f

itself (i.e. matched filter)." Therefore it would be obvious to one of ordinary skill in the

art to combine Rosenfeld with Wang and Eldieb to reach the aforementioned

advantage.

23.   Re claim 13, Wang and Eldieb disclose all of the elements of claim 2. Eldeib

does not disclose any suitable method of template matching i.e. does not whereing

said filter filters according to the minimum square error sum. Rosenfeld discloses

filtering said image dataset according to the minimum square error sum (Section

9.4.1 paragraph 1 note the third of these expressions is the minimum square error.)

The motivation for combining is that "if we use $\iint (f-g)^2$ as a measure of mis-match

we can derive an important measure of match" Therefore it would be obvious to one

of ordinary skill in the art to combine Rosenfeld with Wang and Eldieb to reach the

aforementioned advantage.

Allowable Subject Matter

24.   Claims 5-9 and 17-24 are allowed. Claim 5 and 17 contain allowable subject

matter because the a step of or a navigation system generating a two-dimensional

image dataset by extracting image data representing the images of the marks in a

region parallel to the imaged surface is not found in the prior art of record. The

remaining claims are allowable because they depend from these to claims.

Conclusion

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time

policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE

MONTHS from the mailing date of this action. In the event a first reply is filed within

TWO MONTHS of the mailing date of this final action and the advisory action is not

mailed until after the end of the THREE-MONTH shortened statutory period, then the

shortened statutory period will expire on the date the advisory action is mailed, and any

extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of

the advisory action. In no event, however, will the statutory period for reply expire later

than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the

examiner should be directed to Sean Motsinger whose telephone number is 571-270-

1237. The examiner can normally be reached on 9-5 M-F.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's

supervisor, Jingge Wu can be reached on (571)272-7429. The fax phone number for

the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the

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published applications may be obtained from either Private PAIR or Public PAIR.

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Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a

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system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Motsinger
8/25/2007

SUPERVISORY PATENT EXAMINER